

COMMON REFRACTIVE DISORDERS AMONG PATIENTS IN THE JOS UNIVERSITY TEACHING HOSPITAL (JUTH)

Chifu E.N¹ and E. E. Ike²

¹Physics Department, Gombe State University, P.M.B 127, Gombe.

²Physics Department, University of Jos, P.M.B 2084, Jos, Nigeria

ABSTRACT

A study was carried out to determine the common refractive disorders among patients in the Jos University Teaching Hospital, Jos, Nigeria. A total of 808 eyes were examined for refractive anomalies. 666 (82.4%) of the eyes had refractive anomalies. Hyperopia was found in 360 (44.6%) eyes. Myopia in 234 (28.9%) eyes and Astigmatism in 277 (34.43%) eyes. Further analysis revealed that out of the 234 myopic eyes; 124 (52.9%) had low myopia, 13 (5.6%) had high myopia and 97 (41.5%) had clinically less significant myopia. High hyperopia was found in 44 eyes and 239 eyes had clinically less significant hyperopia. A comparative analysis of the 277 astigmatic eyes showed that no eye had plane astigmatism. 137 (49.5%) had negative astigmatism and 140 (50.5%) had positive astigmatism.

KEYWORDS: refractive disorder, patients, eye, Jos-Nigeria

INTRODUCTION

The eye is the sensory organ of the visual system that transduces light into electrical impulses, which the nervous system then uses to transmit information to the brain. The light perceived is part of the continuum of electromagnetic (e.m) radiation that ranges from radio waves to x-rays. The eye is sensitive to e.m waves in the range from 400 to 700 nm wavelength (Rodney and Pflanzner, 1989).

Refraction of light entering the eye is complex. This is because it encounters several changes in refractive index in its path through the transparent ocular media (air, $n = 1$; cornea, $n = 1.376$; aqueous, $n = 1.336$; lens cortex, $n = 1.386$; lens nucleus, $n = 1.406$; vitreous, $n = 1.336$) (John, 1978). The greatest refraction as might be expected occurs at the air-cornea surface. The normal eye at rest brings parallel rays to focus on the retina and possesses a Dioptric power of 59D.

The normal condition of the eye in which with no accommodation, parallel light is focused on the retina is called emmetropia. Any optical departure from this condition is called a refractive anomaly (ametropia). These are not diseases but disorders. This work considers three main classes of refractive anomalies viz myopia, hyperopia and astigmatism.

The study of prevalence of ametropia began with Steiger in 1913, who measured the refractive power of the cornea in 5000 children. He observed that corneal power and calculated axial length of the eye are independent variables, the interactions of which could cause all refractive anomalies. Children are usually hyperopic at birth and on completion of development become emmetropic. It may result in myopia, however, many remain hyperopic throughout life. Randall (1985) reported increase in hyperopia during school age which decreases through puberty. This agreed with the former study by Hirsh (1959). Jaeger (1938) observed marked increase in myopia at age 12, which decreased at about the ages 13 to 15 years. Staflova (1959) had similar results in Russian children from age of 6 to 14. In the US, the highest prevalence of myopia occurs among Orientals and Jews and the lowest was found in Blacks, Eskimos and Indians (Borish, 1970).

The prevalence of hyperopia greater than +1.25D, an amount that is usually difficult to correct accommodatively, except for brief periods of time is 4-7 percent between the ages of 5 and 20 years. It apparently remains constant

through early middle age and then increases in the population age 45 years and older (Kragha, 1987). Astigmatism has been proven to be the most prevalent error, occurring in conjunction with either myopia or hyperopia. It's

Table 1: Overall Prevalence Of Disorders

Age group (in years)	No. of eyes sampled			No. (%) with refract errors				
	M	F	T	M	F	R	L	T
0 – 9	66	50	116	47(78%)	33(66%)	43(74.1%)	37(63.8%)	80(68.9%)
10 –19	60	56	116	46(76.7%)	47(83.9%)	45(77.6%)	48(88.8%)	93(80.2%)
20 – 29	62	54	116	41(61.1%)	43(79.6%)	42(72.4%)	42(72.4%)	84(72.4%)
30 – 39	66	50	116	55(83.3%)	34(68%)	46(79.3%)	43(74.1%)	89(76.7%)
40 – 49	60	56	116	46(76.7%)	52(92.8%)	49(84.5%)	49(84.5%)	98(94.8%)
50 – 59	74	42	116	72(97.3%)	38(90.5%)	56(96.6%)	56(96.6%)	110(94.8%)
60 – 69	72	40	112	71(100%)	40(100%)	56(96.5%)	56(96.5%)	112(110%)
Total	460	348	808	379(82.4%)	287(82.6%)	337(83.6%)	329(81%)	666(82.4%)

Table 2: Prevalence Of Types Of Myopia

Age Group (in years)	No of myopic			No (%) with low myopia No(%)			No (%) with high myopia			No (%) with ≈Emmetropia		
	M	F	T	M	F	T	M	F	T	M	F	T
0-9	13	23	36	11(84.6)	16(69.6)	27 (75)	0(0)	7(30.4)	7(19.4)	2(15.4)	0(0)	2(5.6)
10-19	22	15	37	05(22.7)	7(46.7)	12(32.4)	1(4.5)	1(6.7)	2(5.4)	16(72.)	7(46.7)	23(62.2)
20-29	19	14	33	11(57.9)	7(50)	18(54.5)	0(0)	2(14.2)	2(6.1)	8(42.1)	5(35.7)	13(39.4)
30-39	21	16	37	09(42.9)	7(43.8)	16(43.2)	1(4.8)	1(6.3)	2(5.4)	11(52.)	8(50.0)	19(51.4)
40-49	18	16	34	07(38.9)	6(37.5)	13(38.2)	0(0)	0(0)	0(0)	11(61.)	10(62.)	21(51.4)
50-59	11	14	25	09(81.8)	8(57.1)	17(68)	0(0)	0(0)	0(0)	2(18.1)	6(42.9)	8(32.0)
60-69	21	11	32	15(71.4)	6(54.6)	21(65.6)	0(0)	0(0)	0(0)	6(28.6)	5(45.5)	11(34.4)
Total	125	109	234	67(53.6)	57(52.3)	124(52.)	2(1.6)	11(10.)	13(5.6)	56(44.)	41(37.)	94(41.5)

Table 3: Prevalence Of Types of Hyperopia

Age Group (in years)	No of hyperopic eyes			No(%) with low hyperopia			No (%) with high hyperopia			No (%) with ≈ Emmetropia		
	M	F	T	M	F	T	M	F	T	M	F	T
0-9	33	08	41	9(27.3)	2(25.0)	11(26.8)	09(27.3)	0(0.0)	09(21.9)	15(45.5)	06(75)	21(51.2)
10-19	19	25	44	2(10.5)	2(8.0)	4(9.1)	01(5.3)	02(8.0)	03(6.8)	15(78.9)	21(84)	
20-29	22	27	49	4 (18.2)	2(7.4)	6(12.3)	02(9.1)	02(7.4)	04(8.2)	16(72.7)	23(85.2)	39 (79.6)
30-39	28	19	47	3(10.7)	1(5.3)	4(8.5)	02(7.1)	01(5.3)	03(6.4)	23(82.1)	17(89.5)	40(85.1)
40-49	22	29	51	2(9.1)	4(31.8)	6(11.8)	03(13.6)	0(0.0)	03(5.9)	17(77.3)	25(86.2)	42 (82.4)
50-59	51	21	72	16(31.4)	5(23.8)	21(29.2)	04(7.8)	01(4.8)	05(6.9)	31(60.8)	15(71.4)	46 (63.9)
60-69	39	17	56	16(41.0)	6(35.3)	22(39.3)	10(25.6)	07(30.4)	17(30.4)	13(33.3)	04(23.5)	17 (30.4)
Total	214	146	360	52(24.2)	22(15.2)	74(20.6)	31(14.5)	13(8.9)	44(122)	130(60.7)	11(76.0)	239 (66.4)

prevalence is estimated to be atleast 70% if all amounts of astigmatism are included but decreases to about 3% if the degree is limited to 1.25D or more (Blum *et al*, 1959). Racial differences in the prevalence of astigmatism are not well documented. Emina and Kio (1997) after examining 1800 eyes in Warri metropolis of Delta State, observed that 73% of the eyes were with refractive anomalies.

The incidence of refractive anomalies thus varies with age, sex, race, population group, medical and surgical anomalies and environmental conditions. No single study can meet all criteria and no condition applies to all people (Borish, 1970). It is therefore vital to take a survey of refractive anomalies among patients in the Jos University

Teaching Hospital (JUTH). This will give clues to the visual needs of the population and provide data for effective primary health care management in Nigeria.

Table 4: Prevalence Of Types Of Astigmatism.

Age Group (in years)	No of Astigmatic eyes			No(%) with +ve astigmatism			No (%) with – ve astigmatism			No(%) with plane	
	M	F	T	M	F	T	M	F	T	T	
0-9	11	24	35	06(54.6)	07(29.2)	13(37.1)	05(45.5)	17(70.8)	22(62.9)	-	
10-19	23	28	51	09(39.1)	17(60.7)	27(50.9)	14(60.9)	11(39.3)	25(49.1)	-	
20-29	14	20	34	02(14.2)	10(50.0)	12(35.3)	12(85.7)	10(50.0)	22(8.2)	-	
30-39	16	22	38	06(37.5)	11(50.0)	17(44.7)	10(62.5)	11(50.0)	21(55.3)	-	
40-49	16	20	36	06(37.5)	13(65.2)	19(52.8)	10(62.5)	07(35.0)	17(47.2)	-	
50-59	23	16	39	15(65.2)	06(37.5)	21(29.2)	08(34.8)	10(62.5)	18(46.2)	-	
60-69	31	13	44	22(71.0)	07(53.9)	29(65.9)	09(29.0)	06(46.1)	15(34.1)	-	
Total	134	143	277	66(94.7)	71(49.7)	137(495)	68(50.8)	72(50.3)	140(50.5)	-	

Key

M - Male eyes, F - Female eyes, T - total=M+F

MATERIALS AND METHODS

Materials

The study group comprised 404 patients (230 males and 174 females) on consultation at the Jos University Teaching Hospital, (Plateau State, Nigeria) over a 6 months period (Oct. – 2005 to March – 2006). For the purpose of the study 6/6 visual acuity was accepted as the standard normal vision at 6 meters using the Snellen illiterate “E” chart; but those subjects with less than 6/6 vision had thorough refraction done on them to ascertain their actual refractive error. Trial lenses, frame and accessories and a retinoscope were employed for effective screening.

Experimental methods

Measurements of Visual Acuity

The acuity of the eye is defined as the minimum angular separation of two equidistant points of light, which can just be resolved by the eye. For this research work, the Snellen illiterate “E” was used for the measurement of Visual Acuity at 6 meters. This chart was used for all subjects whether literate or illiterate. Any eye with less than 6/6 visual acuity was considered to have a refractive anomaly.

Measurement of Eye Refraction

Measurement of the refraction of the subject or as it is commonly called refracting a subject was done objectively using retinoscopy. In this procedure, a beam of light from a retinoscope was directed through trial lenses into the subject's eye and moved within his pupil. By looking through the retinoscope and comparing the movement of light seen reflected from the subject's fundus; trial lenses which corrected any refractive anomalies could be selected.

The subjective test was then used to verify and to increase the accuracy of the objective findings. In this case, the subject looked critically at a distant object while combinations of trial lenses were placed in front of the eye being tested and he was asked which of a pair of alternative lens combinations gave clearest definition of the test object.

RESULTS AND DISCUSSION

A total of 808 (460 male and 348 female) eyes were examined for refractive anomalies. 666 (82.4%) eyes were found with errors. The overall percentage prevalence of errors is shown in table 1 and Figure 1. A total of 234 (28.9) eyes were found to be myopic; 109 (31.3%) female eyes and 127 (27.17%) male eyes. A comparative analysis of the types of myopia showed that out of the 234 myopic eyes; 124 (52.9%) had low myopia ($> -6D$ and $-0.75D$), 13 (5.6%) had high myopia ($\leq -6D$) and 97 (41.5%) had clinically less significant myopia ($> -0.75D$) \approx emmetropia (table 2).

Hyperopia was found in 360 (44.6%) eyes; of which 146 (41.9%) were female eyes and 214 (46.5%) were male eyes. A comparative analysis of the hyperopic eyes showed that out of the 360 cases; 74 (20.6%) had low hyperopia ($\geq 1.5D$ and $< 6D$); 44 (12.2%) had high hyperopia ($\geq 6D$) and 239 (66.4%) had clinically less significant hyperopia ($< 1.5D$) \approx emmetropia (table 3). 277 proved to be astigmatic; 143 (29.1%) male eyes. The prevalence of Astigmatism is shown in Figure 2. Further analysis showed that 137 (49.5%) had positive astigmatism and 140 (56.5%) had negative astigmatism. No eye was found with plane astigmatism (table 4).

Myopia of between $-0.25D$ to $-10.00D$ were commonly observed. Females were found to be more myopic than males in the age groups 0-9, 30-39 and 50-59. Males with $+1.00D$ hyperopia were observed to be in high proportion in the age groups 20-29, 30-39 and 50-50 (table 3). Females were found to be more astigmatic than males in all the age groups. There was a significant difference between the prevalence of astigmatism among male eyes and female eyes (d-test at $p = 0.05$). No eye was found with plane astigmatism, suggesting that astigmatism exist in close union either with myopia or hyperopia.

The number of eyes with refractive errors was high in the age groups 10 to 69 years and ad its peak in the 60-69 age group. This patterns of refractive errors could be attributed to exposure to various forms of light particularly the ultra-violet rays (e.g. rays from television and computer screens). A similar report was made by Cogan and Kinsey (1947)

CONCLUSION

Hyperopia was apparently more in the sampled population. A total of 360 (44.6%) hyperopic eyes were observed. There was no significant difference between the male and the female eyes and the right and the left eyes. The range of refractive errors was between $-10.00D$ and $+11.00D$. In all out of the 808 eyes sampled, 666 (82.4%) were found with refractive errors.

There is therefore a need for periodic eye examination in order to prevent progressive refractive anomalies and blindness. This is recommended particularly for those people involved in visual task that may constitutes visual hazards. This research work has also highlighted the refractive visual needs of the population for strategic health plan.

REFERENCES

- Blum N, Cyril A, Keele E, Eric N and Norman R. (1959); Association of High Myopia in Children. Eye 1959; 15 : 70-4
- Borish I. M. (1970); Clinical Refraction Vol 1, 3rd Ed . Professional Press Inc. East Ontario street Chicago Illinois.
- Cogan and Kinsey (1947); Ultraviolet Keratitis. Vision 31:1.
- Emina O.M and Kio F.E (1997); Refractive Anomalies in Warri Metropolis, Delta State, Nigeria; Zuma Journal of Pure and Applied Sciences 6(2) 2004.
- Hirsch M.J. (1959) ; Myopia, the Present Status. International Congress on Myopia, New York.
- Jaeger .E. (1938); Investigation de Shuler myopic. Klinische Monatshefte Augenheilk 101: 205
- John Parr (1978). Introduction to Ophthalmology, Oxford University Press pp41-46.
- Kragha I.K. O.K (1987); Uncorrected Distance and Near Visual Acuity ; Prevalence and Relationship to Refractive Error and Bifocal .Add. J.N O.A 322 – 26.
- Randall B.E (1985) ;The Refraction of The Human Eye . Am. J. Med Science 9-: 132.
- Rodney R and R Pflanzner (1989). Human Physiology; Sanders College Publishing. Dublin, Ireland.
- Staflava J. (1959); Results of Ophthalmologic Examination in School Children, Ophthalm 15 : 329

Steiger A. (1913). Die Entstehung der spharischen Refractionem des Menschlichen Augen, Berlin.

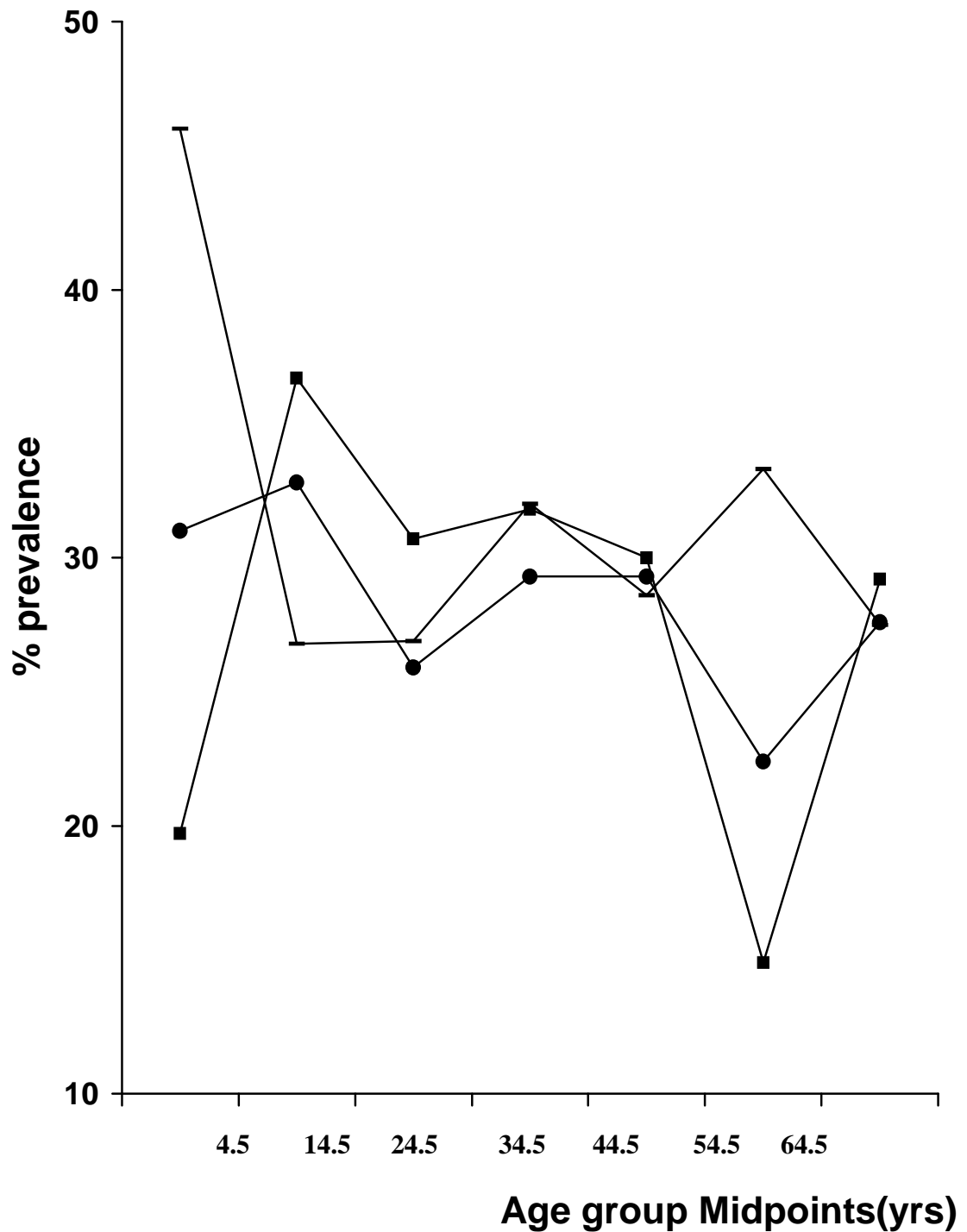


Fig 1: The Prevalence of Myopia

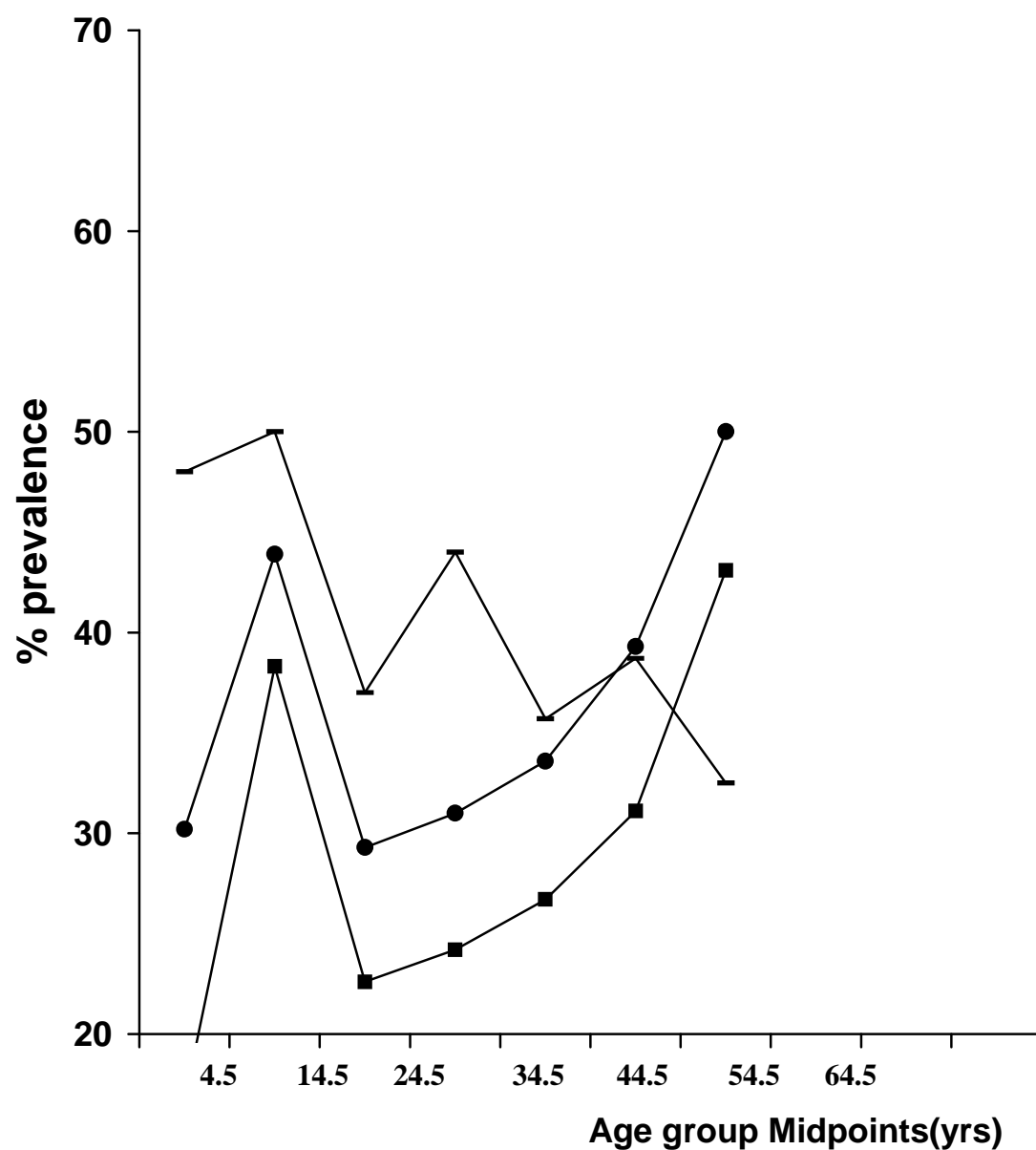


Fig 2: The Prevalence of Astigmatism

Received for Publication: 10/08/2007

Accepted for Publication: 13/09/2007

Corresponding Author:

Chifu E.N

Physics Department, Gombe State University, P.M.B 127, Gombe

ebenechifu@yahoo.com